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(54) A method of installing between supports such as rafters a mineral fibre material provided in roll form, a mineral fibre strip suitable for carrying out the method and a method of producing the said mineral fibre strip

(57) From a mineral fibre strip (1 Fig 1) supplied in roll form, portions (L Fig 1) are cut off, the length of which is slightly greater than the width between rafters and hence is a force fit when pushed between the rafters and the lateral edges (6) of the mineral fibre strip (1) form the top edge and the bottom edge. In this way, it is possible to achieve virtually completely wastage-free roof insulation even when the distances between the roof rafters very considerably and it is possible to work with material of one uniform and considerable width which is supplied in the form of rolls. To facilitate guidance of the cut for separating the portions (L), it is possible to provide on one side of the mineral fibre strip (1) marking lines (5) which can, during production, be generated by a co-rotating roller having linear heated zones.

Fig. 2

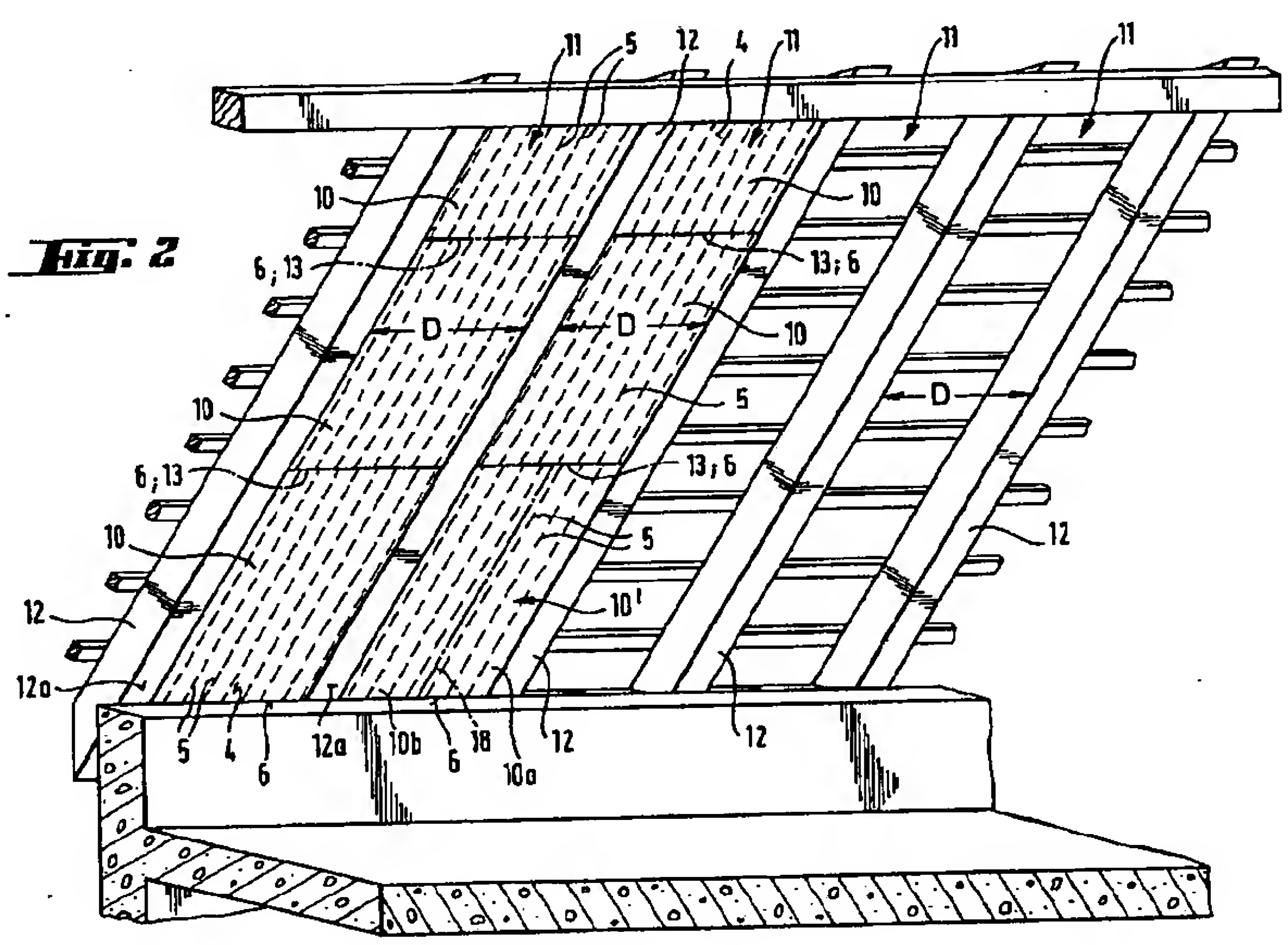

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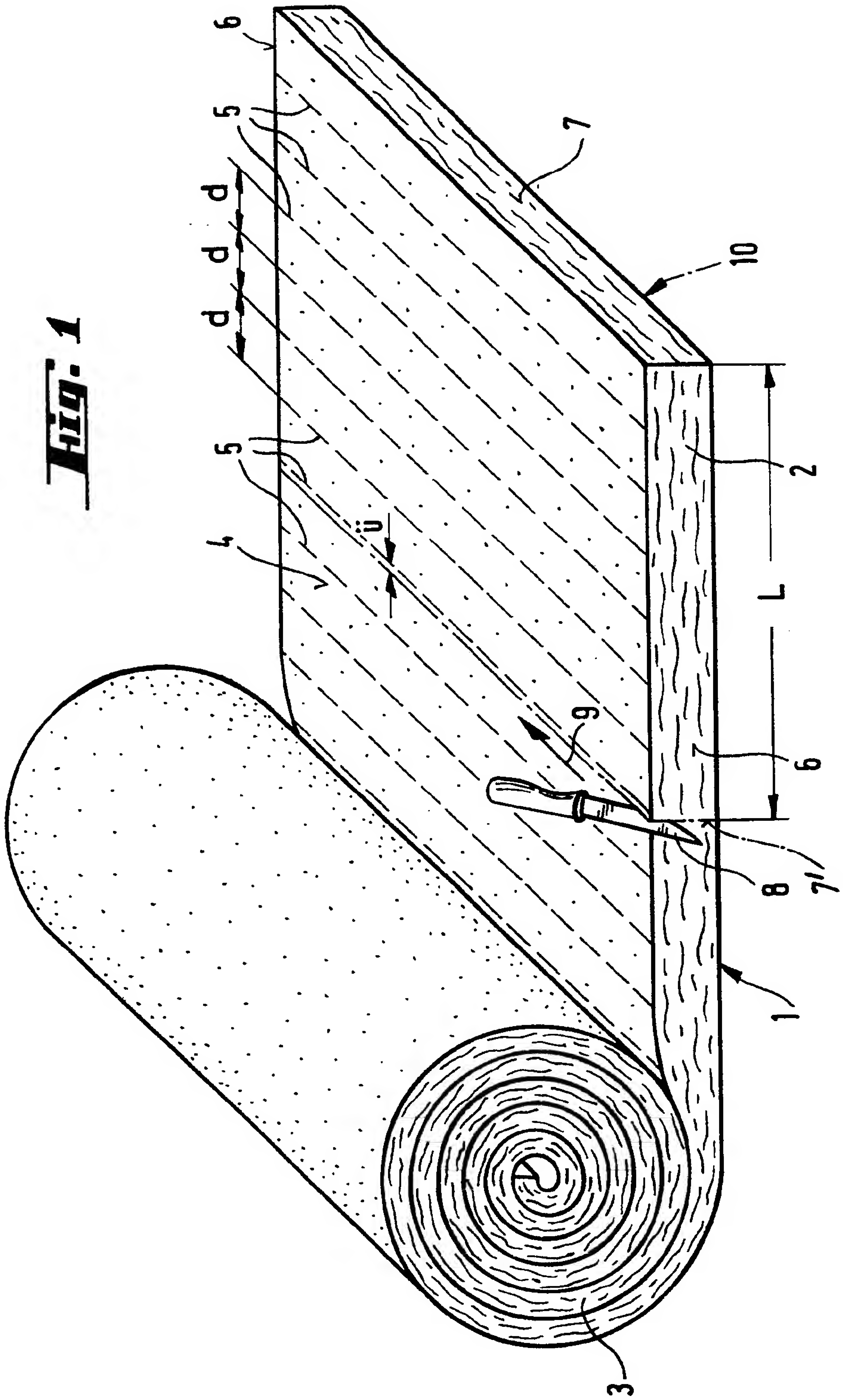
Fig. 1



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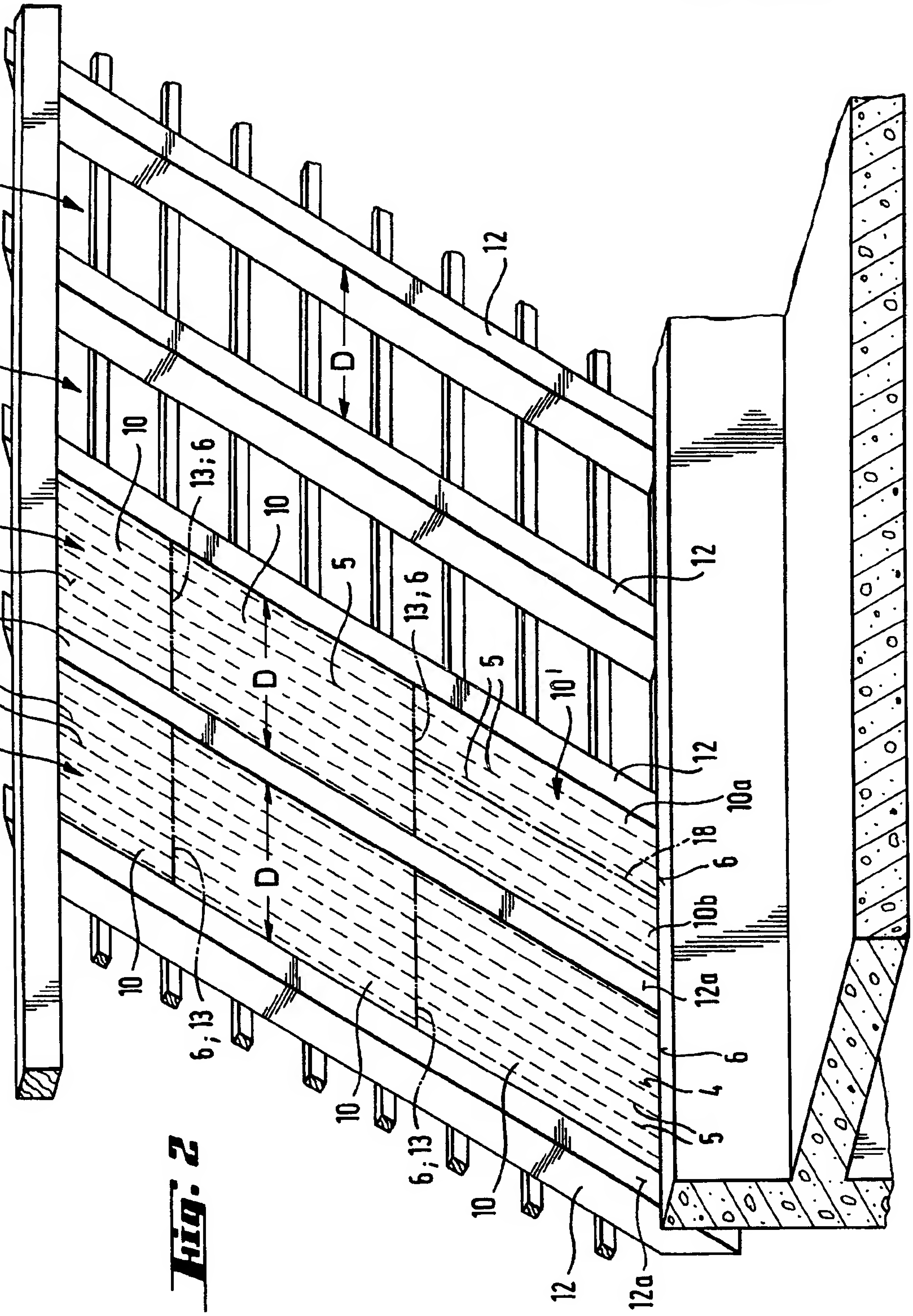

Fig. 2

SPECIFICATION

A method of installing between supports such as rafters a mineral fibre material provided in roll form, a mineral fibre strip suitable for carrying out the method and a method of producing the said mineral fibre strip

The invention relates to a method of installing mineral fibre material containing a binder and provided in roll form into an elongated installation space bounded by lateral supports, particularly an area between two roofing spars or rafters, according to the preamble to Claim 1, and also to a mineral fibre strip suitable for carrying out the method and according to the preamble to Claim 5 and a method of producing such mineral fibre strip, according to the preamble to Claim 9.

Particularly when insulating the space between rafters with mineral fibre material, one essential difficulty is that the strip or panel-shaped prefabricated mineral fibre material has to be manufactured and made available in clearly defined widths, although the distances between the rafters may, however, vary from one building site to another and frequently—and particularly in old buildings—even from one area of rafters to another and even within one and the same area of rafters. The mineral fibre material must be installed with a certain pressure between the rafters and this should be on the one hand sufficiently great to avoid any gaps along the edges, to prevent cold bridges and convection, and in order to achieve a retaining effect while on the other hand, the pressure should not be so great as to produce bulging of the material, which might unintentionally close off the rear ventilation gap and defeat the desired formation of a flat inside face to the insulation. According to the compressibility of the mineral fibre material, therefore, the oversize when installing should be in the range between 1 and 5 cm.

Known from DE-OS 32 29 601 is a sheet of insulating material which permits of proper installation even by inexperienced handlers and nevertheless substantially facilitates adaptation to the particular rafter width involved. Since this insulating material has no functional disadvantages compared with a normally fitting insulating material, either in installation or in effect, it has succeeded in becoming in practice. Facilitation of fitting resides in the fact that there are in the lateral marginal zones of the layer of insulant differently coloured marking lines which do not actually weaken the layer of insulant, being only visually identifiable but which define modular marginal strips which can be cut off for adaptation to the relevant rafter width. Therefore, the user need only select the marking lines at which a cut is to be made, then places a cutting aid between the layer of insulant and the lining and can immediately and without any further aids such as a straight edge or the like, carry out the cut along the given marking line and at one stroke, needing only to ensure that his knife follows the marking line. However, it is always a disadvantage that cutting of the insulating material to suit the desired rafter width will necessarily result in the wastage.

To avoid wastage, it is also known, for example from DE-OS 32 03 624, to depart from a rectangular panel or strip shape and to use instead wedge-shaped insulating panels which are constructed, for instance, like a triangle. These wedge-shaped panels should be produced to be slightly undersized, installed individually between the rafters and wedged in there against a second panel which is fitted the other way round so that the desired pressure of contact is achieved.

Wedging panels against one another in the area between the rafters does, however, encounter practical difficulties in the case of mineral fibre material because the spreading-apart wedging effect which has to be achieved with such a pair of panels presupposes the panels sliding on the adjacent oblique surfaces, but the consistency of mineral wool only allows this to an extremely limited extent, if at all. Furthermore, if the cathetus of the triangular panel which runs at a right-angle to the longitudinal extension of the rafter area does not happen to correspond with the distance between the rafters, then there is the further difficulty that a latterly projecting tip of one wedge of insulating material will be squashed on the rafter while an upwardly projecting tip will be squashed against the button of a panel. This results in localised accumulations of material which disturb the mutual contact between panel elements and will incontestably lead to gaps between adjacent panel edges which will in turn produce cold bridges and convection. To avoid big projecting tips and the resulting gaps, its necessary to MAKE AVAILABLE a multiplicity of nominal widths of panel, which leaves the situation unchanged.

A further essential disadvantage of this method lies in the fact that the wedge-shaped mineral fibre panels have to be packaged and delivered in stacks of panels and cannot be rolled up. Mineral fibre strips which are stored and delivered in the form of rolls offer in contrast the advantage of a considerably reduced amount of space for transport and storage, since the mineral fibre material is greatly compressed in the roll and by reason of the pressure which takes effect in the roll shape, the material can be compressed without any localised irreversible squashing. With such mass produced items of low raw density, a reduction by, for example, a half in terms of transport and storage volume provides quite perceptible cost advantages, also in consideration of the corresponding saving on packaging material.

Therefore, every attempt should be made to find a procedure by which the mineral fibre material can be packaged and delivered in roll form.

Adopting as a premise the procedure disclosed in DE-Os 32 29 601, in which the mineral fibre material is made available in roll form, the invention is therefore based on the problem of providing a method of installing mineral fibre material, for example in an area of rafters and wherein wastage during installation is minimised or entirely avoided, while it is possible entirely to dispense with manufacturing and stock-keeping of mineral fibre material in different nominal widths without any increased labout costs being incurred by installation.

Cutting losses can be completely avoided by such a "transverse installation" of length portions cut from

the roll, since the width of the strip which can be maximised from the manufacturing aspect, lies in the longitudinal direction of the rafter area, and the width of each rafter area is taken into account directly by the single separating cut by which a longitudinal portion is cut from the strip of mineral fibre in order to form a mineral fibre panel which is ready to be installed. If the roll is made available in a width, for example 1200mm, then a few straight cuts will be sufficient to produce a necessary number of mineral fibre panels to fill the rafter area and to ensure the required fit for a clean fit between the rafters. With corresponding adaptation of the oversize provided at the time of cutting to suit the compressibility of the mineral fibre material, it is sufficient simply to push each panel snugly between the rafters for the panel to remain there without any further retaining means, a gap from the adjacent panel being closed up simply by pushing the most recently installed portion. The end panel in the ridge area can be cut off if it is overlong, and the cut off end can be installed in another rafter area of appropriate width, so that there is no wastage even at the ends of the rafter area.

Compared with the procedure according to the said pamphlet, therefore, despite the fact that the mineral fibre material is supplied in only a single nominal width, there is a further considerable reduction in wastage, generally to nil. Furthermore, it is possible favourably to work with material from the roll and the labour cost involved in installation is considerably reduced by the substantially larger panel areas, although nevertheless each panel can easily be handled by a single person and because, in spite of the size, the insulating material fits between the rafters as if it were to a certain extent cut to size. Furthermore, the number of joints between the panels which are not in themselves desirable if one adopts the premise of filling the entire rafter area with as few joints as possible in order to overcome any possible weak points, can be considerably reduced, since only a few transverse joints occur in any rafter area and by virtue of the fact that the panels lie flat in the rafter area, any gaps can be reliably closed by pushing the panels up against one another.

By reason of the considerable width of the rolls of insulating material made available and considering the rolls to be 5 m or more in length and allowing for the avoidance of any wastage through cutting, one roll can on average be used to insulate approximately two rafter areas, ie. the space between any two rafters. Therefore, less importance attaches to the fact that as a rule, the last remaining portion which produces too small a panel width, can only be used for some other purpose after it has been cut to size, so that here there would be wastage but to a negligible extent. However, the measure according to Claim 2 avoids any wastage even at the end of the roll, since the insufficient width of a portion left over at the end of one roll can be made up by taking a correspondingly narrow portion from the beginning of the next roll so that these two portions can be used to make up a two-part panel of the desired size and without any wastage. The only peculiarity in such a panel is a vertical joint in the rafter area and this will occur, for instance, in every second or third area between rafters.

If the height of the spar panel (square is the term used in roof construction — DST) does not correspond to a whole-number multiple of the height of the mineral fibre panels — corresponding to the width of the mineral fibre strip — then the last mineral fibre panel to be fitted will project beyond the square in the roof ridge area.

To avoid waste material in this context, too, Claim 3 envisages the projecting portion of the mineral fibre panel being cut off, so that the remaining part of the panel still fits in the roof ridge area while the cut-off part is used as a reduced-height starter panel for filling in the next square which is to be filled in. In this way, wastage of material is minimised in this direction, too, when the last square has been filled in, in other words, there is no use of the cut off part of the mineral fibre panel for starting fitment into a subsequent square; instead, such a small quantity of cut off mineral fibre material can quite easily be used for other filling-in applications.

Since a lining on the mineral fibre strip has to be cut through at the same time when the individual panels are made up, after which the transverse joints between the linings in the rafter area and also the edges of the lining have to be closed up at the rafters, it is preferable according to Claim 3 to use unlined mineral fibre material and, if a steam barrier is required for example, to install this after the mienral fibre panels have been laid, the lining being laid to cover the individual mineral fibre panels and possibly also the rafter area, as is already known per se. This cuts the cost of closing up a few less long joints between individual strips, the joints being moreover more readily accessible as a result.

A mineral fibre sheet which is particularly suitable for carrying out the method is indicated in Claim 5. Similarly to the state of the art according to DE-OS 32 29 601, on which the preamble to this Claim is based, marking lines are used which serve as a cutting aid and which are differently coloured, being only visually effective and not in fact weakening the mineral fibre material. Thus, the marking lines have no effect on the ease of handling or efficiency of the mineral fibre material. In contrast to the teaching according to DE-OS 32 29 601, however, the marking lines are set transversely to the length of the mineral fibre strip. In this way, they lie parallel with the cutting direction envisaged within the method according to the invention.

In this respect, the marking lines can according to Claim 5 be equidistant from one another, being for example 100 mm apart. Adjusting different distances which in the case of DE-OS 32 29 601 may be a good idea, does not in this case afford any advantage since the location of the cut in completely undefined during production. A series of parallel lines spaced apart by the same relatively small amount makes it possible to maintain one direction of cut even without a straight edge, purely by eye, so that once the location of the cut has been established, the cut can be made freehand without any further preparation and parallel with the nearest line.

Whereas the wedging effect strived for according to DE-OS 32 03 624 is all the less attainable the lighter the mineral fibre material used, there is not any such

restriction to relatively heavy and dense material, within the framework of the invention. This makes a further contribution to a saving of material. According to Claim 7 a crude density between 10 and 30 kg/cu.m and in particular between 14 and 25 kg/cu.m is preferred, the bottom range of crude density for mineral fibre material of heat conductivity group 040 and the upper range for material in heat conductivity group 035 being particularly suitable.

Whereas the said crude densities correspond substantially to the crude densities of the mineral fibre strip of DE-OS 32 29 601, the binder content can according to Claim 8 be somewhat higher, between about 6 and 7% by weight of dry binder in the product, the lesser content of binder, in accordance with the indicated range applying to material of heat conductivity group 035 while the higher binder content applies to material in heat conductivity group 040. By reason of the somewhat increased binder content, there is a rather greater stiffness and thus a better retaining effect when an insulating panel is pushed in between the rafters.

The winding capacity is not adversely affected thereby.

Claim 8 indicates a method of manufacturing such a mineral fibre strip on a basis of the method known from DE-OS 32 29 601. According to it, the transverse marking lines are applied by the action of heat and a co-rotating roller disposed to rest on the top of the production strip, the surface of the roller having correspondingly strip-like heated zones. These heated zones can be, for instance, produced by projecting heated ribs on the roller or by some other means so that as it passes through the lowest position on the periphery of the roller, the heated zone makes direct contact with or remains at a distance from the surface of the mineral fibre sheet, the heat effect being generated locally. The production of transverse markings in this way also has its own significance even independently of the method of installation according to the invention.

Further details, advantages and features of the invention will become evident from the ensuing description of an embodiment shown in the accompanying drawings, in which:

Fig. 1 is a perspective view of a roll of mineral fibre material with the end portion unrolled, and

Fig. 2 is an illustration of the installation between rafters of the mineral fibre panels produced by cutting lengths from the strip of mineral fibre material.

The mineral fibre strip 1 shown in Fig. 1 and of which the leading end portion 2 is shown unlined, shall for the sake of example be an unlined strip 1200 mm wide, with a nominal thickness of 100 mm and a length of 6 m. With a crude density of, for instance, 18 kg/cu.m and a phenol resin binder content of 6.6% by weight (dry), the resultant material falls within heat conductivity group 040.

Attention should be drawn to the fact that the position of the mineral fibre sheet 1 shown in Fig. 1 and with the leading end portion 2 only partially unrolled would not arise in practise without the application of corresponding retaining forces, since the internal stress in the winding 3 of the roll is so great that when the covering is removed, the entire roll opens out and the mineral fibre strip 1 is in a completely extended condition, as is shown for the leading end portion 2 in the drawing. This is true not only by reason of the compression of the material in the rolled-up state, for instance in the ratio of 1:2.5, but also because of the spring-back or recovery force of the mineral fibre material in itself. As can be seen from Fig. 1, when it is unrolled, the mineral fibre material opens out to its nominal thickness. During manufacture of the mineral fibre strip 1 on the production line, a thickness excess of about 10 mm is incorporated. After compression of this material in the roll over a prolonged period, it then springs open and recovers its nominal thickness of, for example, 100 mm.

Applied to the surface 4 of the mineral fibre strip which is on the inside when it is rolled up are marking lines 5 which extend at a right-angle to the lateral edges 6 of the mineral fibre strip 1 and parallel with the front edge 7 of the mineral fibre strip 1. In the example of embodiment, let it be assumed that the marking lines 5 are applied at equal distances, the distance d between two adjacent marking lines being, for instance, 100 mm. As Fig. 1 illustrates, the marking lines 5 need not be continuous lines but can also be broken lines. What is however essential is that the marking lines 5 not be constituted by cuts, scores or the like, but that they should be purely visually affective and not notably influence the ease of handling and efficiency of the material in the mineral fibre strip 1.

In order to fill in a rafter area having a width D of, for example, 700 mm as shown in Fig. 2, a length portion L 710 mm long is measured out along the marking lines 5, to allow for the oversize U of, for instance, 10 mm, which is required to ensure contact pressure and starting from the leading edge 7 of the mienral fibre strip 1. This portion is then cut off at 7'. To this end, in the manner shown in Fig. 1, a knife 8 is applied to the measured out cutting line and is drawn through the material in the direction of the arrow 9 and parallel with the adjacent marking line 5.

Thus is formed a panel 10 of insulating material such as can be seen in Fig. 2. The insulating panel 10 is twisted so that what were previously the lateral edges 6 of the mineral fibre strip 1 are at top and bottom, the length portion L determining the width of the mineral fibre panel 10. In this position, the mienral fibre panel 10 is inserted into one of the rafter areas 11 between two adjacent rafters 12. The oversize U of the length portion L compared with the width D of the rafter area 11 at the point of installation and amounting in the example of embodiment to 10 mm or a little more ensures the desired contact pressure of the mineral fibre panel 10. After insertion between the rafters 12, the mineral fibre panel 10 thus acquires a clamped-in effect.

The rafter areas 11 which are at the front in the drawing end which are already provided with mineral fibre panels 10, show that only a few (in the example of embodiment 3) mineral fibre panels 10 are required per rafter area 11 for the latter to be completely insulated. In this case, it is firstly the bottom-most mineral fibre panel 10 which is inserted between the adjacent rafters 12 and — possibly after prior minimal cutting of the bottom edge of the mineral fibre panel 10 according to the construction of the bottom end of

the rafter area 11 — pressed down and pushed. Then the next mineral fibre panel 10 is inserted over the already installed mineral fibre panel 10, pressed in between the rafters 12 and pushed down so that it bears closely on the already installed mineral fibre panel 10. In this way, a few movements are sufficient for complete insulation of one rafter area 11. The transverse joint 13 indicated by dash-dotted lines and disposed between adjacent mineral fibre panels 10 is virtually unnoticeable from a distance when viewed with the naked eye. If, as illustrated, the mineral fibre panels 10 are installed with the marking lines 5 on the inside, all that can be seen is that this point there is an offset of marking lines 5. If necessary, of course, it is also possible to install the mineral fibre panels 10 with the marking lines 5 extending in the direction of the outside of the roof.

As Fig. 2 shows, the upper insulating panels 10 point towards the roof ridge and in the installed position they are of lesser height than the mineral fibre panels 10 below them, in the example of embodiment, half the height. For this purpose, the length portion L from which the upper mineral fibre panels 10 are formed, have been cut through once again in the middle parallel with the lateral edges 6, so that the cut parts of a single mineral fibre panel 10 of full height were sufficient to fill in two rafter areas 11 as far as the roof ridge without the need for any wastage. It goes without saying that the part which was no longer required in the first rafter area 11 could be used even at the bottom of the second rafter area 11, the insulation being built up from that point, and it is quite clear that such a division of a mineral fibre panel 10 is also possible without any problem as a means of finishing off the ridge area, if only a very small or a very large piece of a complete panel is required to complete the insulation in the ridge area. All that is necessary is that somewhere another rafter area 11 of the same width be available and allowing for a negligible amount of wastage, the balance of the cut off mineral fibre insulating panel 10 can also be used for a rafter area 11 which is of a different width.

Similarly, at the end of the mineral fibre strip 1, after the last cut has been made, a portion 10a will be left the length of which will be less than the width D of a rafter area 11 which is to be insulated. In this case, a complementary portion 10b can be cut from the next roll and joined with the remnant from the preceding roll to form an installation unit 10′ which will once again have the dimensions desired of a mineral fibre panel 10 and which can be installed in exactly the same way as a one-piece mineral fibre panel 10. The longitudinal split 18 which occurs in this case is closed off cleanly by the pressure between the rafters 12.

Once all the rafter areas 11 have been filled with mineral fibre panels 10, a steam barrier of polyethylene film can be applied all over, the individual strips fixed, for example, tranversely across the rafter areas 11 and on the inside faces 12a of the rafters 12 possibly being sealed in the joint area by means of self-adhesive film.

In this way, starting with a mineral fibre strip 1 delivered in roll form and of appropriate consistency, it is possible to work virtually completely without wastage, regardless of whether the building involved is new and has very regular intervals between rafters or whether it is old with vastly differing gaps between rafters. The additional expense in the case of an old building is only increased measuring work; even there, material losses will not arise. The few mineral fibre panels 10 required per rafter area 11 can be produced by a few cuts made by a freehand along the marking lines 5, the panels being inserted conveniently between the rafters 11 with one action, even when the operative is working alone, and the panels have the effect of being clamped between the rafters, so that despite the provision of accurately fitting mineral fibre panels 10, the labour costs are extremely low even if the distance between rafter vary greatly. From the point of view of manufacture, the mineral fibre strips 1 can be produced with existing production plants and winding machinery, a simple accessory arrangement being required in the form of a roller for producing the marking lines 5. Since it is possible to work with a single width of roll, production and stock-keeping are considerably simplified; also, prior to buying the insulating material, the buyer need not make any special measurements of all the distances between rafters in order to prepare a list of the required quantities of mineral fibre material in the strip widths required. Instead, he can buy the necessary number of identical rolls according to the overall area to be insulated and can be sure of being able easily with them to insulate the roof of the indicated area without wastage.

CLAIMS

1. A method of installing mineral fibre material provided in roll form into an elongate installation space bounded by lateral supports, in which the roll form mineral fibre material is initially unrolled, then cut to size according to the width of the installation space at the installation site, plus an over-measure, and is then inserted with a push-fit action between the supporters, characterised in that the mineral fibre material is sub-divided into longitudinal portions by cuts extending transversely to the length of the strip and the length of the portions corresponds to the local width required for installation, plus an over-measure, and in that the mineral fibre panels produced by the cut off lengths are inserted between the supports that they have their cut edge against the supports and the edges which were their lateral edges in their previous roll form bear one on another.

2. A method according to Claim 1, characterised in that an end portion of mineral fibre material on one roll which is shorter than the desired width for installation purposes is supplemented to the desired installation width by a complementary portion of mineral fibre material, the two portions being joined to form one two-part mineral fibre panel which is introduced between the supports.

3. Method according to Claim 1 or 2, characterised in that a part of the last mineral fibre panel to be fitted into an installation area and exceeding the height of the latter is cut off and used as a starting portion for filling a subsequent installation area.

4. A method according to Claim 1, 2 or 3 characterised in that after installation of the unlined mineral fibre panel between the supports, a covering film spanning a plurality of mineral fibre panels is fixed

between exposed surfaces of the supports.

5. A mineral fibre strip (1) which can be supplied in roll form for carrying out the method according to one of Claims 1 to 3 with, to serve as a cutting aid, marking lines (5) which are differently coloured and only visually effective, not weakening the mineral fibre material in any way, characterised in that the marking lines (5) extend transversely of the longitudinal direction of the mineral fibre strip (1).

6. A mineral fibre strip (1) according to Claim 5, characterised in that the marking lines (5) are at the same distance d from one another.

7. A mineral fibre strip (1) according to Claim 6 in which the distance d is about 100 mm.

8. A mineral fibre strip (1) according to Claim 6 or 7 characterised by a crude density of 10 to 30 kg m^{-3}.

9. A mineral fibre strip (1) according to Claim 8 having a crude density 14 to 25 kg m^{-3}.

10. A mineral fibre strip according to any one of Claims 6 to 7 characterised by a binder content of between 6 and 7% by weight.

11. A method of producing a mineral fibre strip according to any one of Claims 6 to 10 in which a layer of insulating material is produced continuously, binder being added and the binder being hardened, and in that the action of heat produces marking lines, characterised in that disposed above the insulating layer and transversely of its direction of movement there is a roller which revolves at a peripheral speed corresponding to the production speed of the layer of insulating material and which has strip-like axial heated zoned for locally heating the surface of the insulant in order to produce the marking lines.

12. A method for installing insulation material substantially as described herein.

13. A mineral fibre strip substantially as described herein and as shown in the accompanying Figs. 1 and or 2.

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